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DESIGN REQUIREMENTS FOR

TECHNICAL AIDS FOR THE MENTALLY HANDICAPPED

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DESIGN REQUIREMENTS FOR TECHNICAL AIDS FOR THE MENTALLY HANDICAPPED

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Memory Aids for the Mentally Handicapped

INTRODUCTION

Memory is a complex set of mental functions. Most types of mental disability involve some impairment of memory. Even people without a specific mental handicap may occasionally have problems remembering. Memory aids, such as appointment books, are commonly used to assist people's memories.

There are all sorts of potential memory aids for the cognitively disabled. These range from simple checklists and instructions to sophisticated micro-computer network adaptations. Specialized training programs or software can also be used to improve a person's own memory abilities. This section describes the general problem and reviews a specific memory aid for dispensing medication.

NATURE OF THE PROBLEM

Memory is a basic function of the brain. If people can't remember names or faces or voices, their ability to establish relationships is hampered. If they don't remember phone numbers, they may be unable to get help in an emergency. Forgetting where you are in a sequence of steps causes problems in activities like cooking. In fact, memory problems can interfere with almost any activity.

One particular problem deals with taking medication. Mentally handicapped persons may forget to take needed medication. Or they may forget that they took it and end up taking more than they should. For people taking a variety of different medications on different schedules, the demands on memory are even greater.

USER GROUP

Memory can be a major problem for anyone with a mental disability. People whose impairment is related to aging commonly experience memory disabilities. Those surviving a stroke or brain damage may have memory disorders among their neurological deficits. Retarded and learning disabled people usually have memory problems also.

Unfortunately, not all of these memory problems are the same. The abilities of different mentally disabled persons to use a specific memory aid also vary greatly. Thus there is not one general aid that would assist in all of these problems. However, a few different types of memory aids could provide significant benefit to many disabled and non-disabled people.

The user group for the device to aid in taking medication on schedule includes people with all kinds of cognitive handicaps. Older people with combined physical and mental problems are the main group needing this type of aid.

BENEFITS

The potential benefits of memory aids could be great in areas of independent living, transportation, employment, health and safety, and recreation. For example, memory aids for activities such as grooming and cooking could help many senile or retarded adults to be self-sufficient in their daily lives. Improved systems for reminding employed persons when to get up, when to get ready, when to leave for work, and how to get there, would help them keep their jobs.

Does not determine if medication is taken
a better system would be an
implanted device or slow release
subcutaneous dispenser

A PRODUCT EXAMPLE

A device for assisting people to take the right dosage of medication on the right schedule would mean more independent functioning, lower care costs, and better health for many mentally handicapped people. Help would be required for setting up the device and putting in the appropriate medication. The system would be most viable as a fixed device. However, a portable unit powered by batteries might also be possible.

Description of Function - The basic functions of the aid are to :

1) dispense the appropriate medicine

2) signal the person that it's time to take the medicine

3) monitor whether or not the medicine is removed from the dispenser, and if the medicine is not removed,

4) continue to signal the person or their caretaker until the correct action is taken.

Essential Features - The device should be able to handle pills, capsules and liquid medicine. It requires a clock, storage

compartments for different medications, some means of programming and controlling delivery of the medicine, a signal that medicine should be taken, and a sensing mechanism to determine if the medicine has been removed. There should be a program for progressively stronger reminders. These wold be sent to the mentally disabled person or as warning signals to a caretaker or helper if the medicine is not taken after a certain period of time.

There are presently clocks on the market that can be set for multiple signals during a 24-hour day. They are often used to control household devices, or to cue hotel operators when to wake up different guests. Home computers can also perform these functions with a clock and special software.

Such a clock could be used to control a medication delivery system. This system should be simple but flexible. Unit doses should be loaded into the device in small containers such as standardized plastic cups. These could hold either pills, capsules or liquid. A caretaker, family member or friend would put the correct doses in the correct order and set the times on the clock. For simple cases, this might only need to be done once a week or even less frequently.

When the clock signals the device to deliver the next medication, a signal (eg. a bell or buzzer) would also be activated to tell the person that their medicine is ready. A photocell or spring activated mechanism could shut off this signal when the medication cup is

removed. If the medication is not removed within a certain time (set as the next stop on the controlling clock), another signal would alert either the person or their helper that the medicine still hasn't been removed.

Desirable Features - The storage unit should have the potential for optional refrigeration, as a small add-on unit, for cases in which medication must be refrigerated. Most modern medications do not require refrigeration, however.

A more useful feature would be multimodal signalling capabilities. Some people would respond better to visual signals, some to auditory. Users or their helpers should be able to set the signal and intensity level that they want.

System failure should also set off a signal to the user and/or helper.

Physical Parameters - For home use the system could be mounted in stationary positions in the kitchen, bathroom, or other frequented places. Water should be available nearby. The clock should only be accessible to the person programming medicine delivery to prevent accidental or misguided tampering. But the user should be able to use it to tell the time or see when the next medication is coming.

It would be possible to have the dispenser cups mounted on a carousel. The timed signal would cause the carousel to rotate the next cup to the opening or to the switch used to activate secondary signals or warnings.

Since the system would be stationary, size and weight are not critical factors. It is important that it be durable and reliable. At the same time, the units should not be unattractive or intimidating. External housings should be made of molded plastic because it is strong, inexpensive, attractive and easy to clean.

Potential Problems - The most common problem with memory aids is that people forget to use them. Even if the aid provides some reminding signal, the user may ignore it. The present system attempts to avoid these problems by giving a variety of signals, and performing different signal functions if a correct reponse is not made within a set time.

Human Factors Requirements - Many mentally handicapped persons are more physically limited than average people. This system should not require particular strength. Need for excessive reach should be avoided by sensible mounting . Mounting height should take the user's reaching abilities into account. The dispensing cups should not be too small because of grasp problems of some mentally disabled persons.

Testing of the system should involve typical users and helpers. Reliability of the system should be thoroughly assessed before it is used for critical applications.

Adaptability - Different groups of users may require modifications to the basic system. For some, the users may be able to load and program medicine delivery themselves. The clock should be able to handle up to 12 deliveries per day, although most applications may require only one to four.

The system of a clock activating a mechanical device and signal to the user could be adapted to other memory aids. If a carousel were activated it could display pictures of necessary steps in a sequence of activities, or appropriate activities for particular times of the day. The user could signal completion of the required act, for example brushing his/her teeth, by pressing the lighted picture. A helper would still need to program the clock and provide the pictorial stimuli. But such a system could make many cognitively disabled people better able to function with less overall help.

A system could even be developed to handle a mixture of memory functions. The carousel could present medication at some times, pictures of required tasks at other times, and environmental control signals to separate equipment at other times.

Signs and Directions - Directions are most important for

the person filling and programming the dispenser. They should be simple and clear so that some mentally handicapped persons could do this task for themselves. The signals to the user and the helper should be tested for effectiveness.

Development - The main features requiring development are the dispenser and the mechanism for signalling a helper in case of system failure or lack of user response. Development costs would make each unit rather expensive on a small scale.

The savings in professional care costs and costs of problems resulting from inadequate compliance with medication regimes could easily pay for the device over the course of its useful life. Market research to test the potential of the system for the general population could lead to larger scale, and cheaper, manufacture.

SUMMARY

There are several potential aids for assisting mentally disabled people in remembering. They range from simple, home-made checklists to multi-purpose computer memory aids.

A device that would help people remember when to take needed medication could provide definite benefits for a large number of mentally handicapped persons. It could also be adapted to serve

other memory functions, such as reminding the user of the proper steps in a sequence of activities.

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Safety Aids for the Mentally Handicapped

INTRODUCTION

The safety needs of the mentally handicapped vary with the degree and type of disability. Safety problems for someone living at home may differ from those of a person living in an institution. One problem that can arise in both situations is locating a mentally disabled person who wanders away or gets lost.

Technical developments should be able to help with some safety problems. Other problems require specific training of cognitively disabled people to respond appropriately in hazardous situations.

NATURE OF THE PROBLEM

Mental impairment can limit a person's ability to react to danger. In some cases the person may not even realize that there is a threat to their safety. The threat may be from fire, toxins, bad weather, other people, traffic, or countless other sources.

Generally, the cognitively impaired person must be trained to respond appropriately to common dangers. At times, this training is incomplete or beyond the potential of the person and his/her teachers. The mentally disabled person can then be protected through some sort of monitoring. Technical advances can contribute to both the training and monitoring of safety for mentally disabled people.

In some situations, such as fire safety for mentally disabled persons, advanced alarm equipment, combined with training and monitoring systems, can enhance safety. In other cases, an advanced type of monitoring system, by itself, would provide significant benefits.

USER GROUP

The safety needs of mentally impaired persons depend on the degree of their impairment and on the kinds of situations that they may experience. Some safety aids have proven useful to the population in general. An example is the type of smoke detector presently on the market. Other safety aids may be useful for only a small portion of the mentally handicapped population. For instance, training devices to teach someone about traffic signals may only be required for moderately to severely retarded persons.

The potential market for a locating device for a lost person is large. Mentally disabled children and adolescents, institutionalized persons, and mentally impaired elderly persons all have the potential for getting lost. Such a device would also be valuable for normal children. Parents who fear that their child might get lost or abducted would be potential buyers for a reliable locating system.

BENEFITS

The benefits of safety devices and aids are easy to describe. It is more difficult to place a dollar figure on their potential value. If a device saves the life of even one disordered patient who wanders away from an institution, or gets lost during a fire, a sizable investment would be justified. Improved safety products can not only save lives, but prevent costly injuries and further disabilities as well. In addition, they can allow mentally handicapped persons to engage in a broader range of activities in a safe manner.

A PRODUCT EXAMPLE

A device for locating lost persons would provide increased safety for many cognitively handicapped persons. Tragedies often result when a mentally disabled person wanders off from their caretaking environment. The lost person may die from exposure, accident or lack

of essential medication before s/he is located.

Advances in radio tracking have come from military and biological research applications. Systems for detecting inappropriate boundary crossings have also been developed to reduce shoplifting. These two technologies should be combined to produce a useful locating system for lost persons.

Description of Function - The basic function of the device would be to provide:

1) activation of an alarm when the user (the mentally disabled person) crosses some critical boundary, and

2) a signal that can be used to locate the person wherever s/he may be.

The critical boundary could be, for example, any one of the building doors for an institutionalized person, or the back yard gate for a retarded child playing at home. The alarm that is activated when the boundary is crossed tells the caretaker that the user has left the safe environment and needs to be found and returned.

The activation of the alarm could be a function of the device worn by the user, or the system could signal any unauthorized boundary crossing.

The signal for locating the lost person must, of course, remain "on" and attached to the person until s/he is found.

Essential Features - A locating system must be adaptable to various situations. For use by individual families or households, the local police might be the most appropriate party to operate the locating system. Some institutions may want to have their own tracking system for patients. In some applications the border crossing system may not be essential.

The locating system must have a transmitter and a localizing receiver. The transmitter must remain attached to the user and must continue to operate. This reqires that the transmitter be impervious to tampering, water, and casual attempts to remove and discard the unit. It must have sufficient power in its battery to operate for several days. The signal must be strong and distinct enough that a person can be located in radio "noisy" environments at a considerable distance.

The distance requirement will vary from one situation to another. Mentally handicapped persons have been known to travel many miles from their safe environment using public transit or rides from strangers. The requirement for a strong signal has important implications for the necessary licensing. It might be necesary to allocate a single frequency for all applications of a lost person

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locating system. But, distinctive modulations may be used.

Effective range of the system is a function of the transmitter's power and the receiver's sensitivity. Transmission and reception must not be blocked by buildings, vehicles or other structures that the lost person may enter.

There could be different grades of transmitters in relation to need, cost, and radio licensing requirement. Units which must be powerful could have quartz crystals to ensure a "clean" signal of precise modulation. Back-yard units could be low-powered and low-priced, such as the current crop of $20 CB walkie-talkies.

The receiver must be mobile and must indicate the direction and relative strength of the signal. Not all users of transmitters will need to own finder-receivers. For example, a voluntary organization could own two or three receivers and sell, say, 400 transmitters to members. When a person is lost, a finding team is quickly assembled and, at that point in time, given a receiver.

Desirable Features - The unit worn by the mentally handicapped person should be small and not obviously stigmatizing. A possible solution would be to put the transmitter and boundary crossing device in a decorative wrist or ankle band or neck pendant. All of these locations permit secure placement that is not too tight for comfort. Another possibility is to implant the device under the

skin, perhaps in association with medical appliances. But the advantages are probably outweighed by other factors such as maintenance difficulty.

The receiver could vary from a hand-held radio with a directional antenna to a sophisticated system for computer monitoring and localization of several different signals.

There are also several options for activating the system. A border crossing activation could employ a different sensor, or use the radio signal itself. In some cases, the mentally handicapped persons might be willing and able to activate the transmitter themselves if they get lost. Such an option would also make the system useful as an alarm and locating device for lost or abducted children.

Physical Parameters - The means of attaching the signalling device to the person necessitates a very small transmitter. The maximum size is about that of an ordinary wrist watch, but smaller is better. However, it should be too large to swallow. The unit must remain attached despite serious efforts on the part of the user to remove it. This necessitates considerable durability. The shape should be such that it does not introduce other hazards or interfere with normal activities. The signalling device should be in a waterproof housing.

Potential Problems - Technical, legal and ethical

problems need to be addressed. The technical problems deal with performance of the system. Testing under varied circumstances will be required to identify and correct any technical "bugs." The main legal problem involves the regulations and requirements for occupying the airwaves with a signal. This issue must be resolved, and the approved frequency or frequencies identified, before product development begins.

The ethical considerations relate to freedom versus control of the cognitively disabled person. Some people find the idea of an implanted locating device too Orwellian. The objections range from mild discomfort with the idea to the stance that mentally disabled people have the right to "escape" from their caretakers if they wish. Even if it were intended for mentally disabled people, such a device could be used in the control of other members of the population, such as persons in correctional facilities. In most cases, however, the cognitively disabled person is already under the supervision of a parent, relative, or caretaker. A locating system would merely make this supervision more safe and effective.

Human Factors Requirements - Human factors data would be required to develop the system for attaching the transmitting device to the person. The range of head, neck, hand, wrist, ankle and foot sizes of the users would provide guidelines for devising a secure attachment. The option for activation by the user requires a switch or button that could be easily turned on voluntarily but not

accidentally.

Adaptability - The system must be adaptable to all age groups from young children to elderly persons. It should function with or without the boundary crossing signal. It should have an option for manually turning the signal on, but it must not permit the user to turn it off.

Signs And Directions - The instructions must ensure secure and safe attachment of the transmitter, and correct use of the system. Usually, the persons setting up the system will be of normal mental ability. The transmitter itself should not be an obvious control device, but it should contain some indication of its purpose so that someone doesn't unwittingly help the user to remove it. The phone number of the caretaking person or institution should be provided on the device.

The instructions for the receiver must also be clearly spelled out so that even persons not familiar with radio technology can use the system successfully.

Development - Many of the components required for such a system are presently available. An important first step in the development of a locating system for lost persons is the approval of a radio frequency for users' transmitters. Adopting a single frequency would facilitate this approval and would permit police to

have a receiver system that would work for any person or institution using such a system. The development of the bracelet, anklet or necklace transmitter would be the other main step.

SUMMARY

Products and aids to enhance safety provide direct benefits by saving lives and reducing injuries. They can provide indirect benefits of added security and decreased worry for both users and their caretakers. Safety aids for the mentally handicapped range from improved training to advanced alarm and monitoring systems.

A device to assist in locating persons who wander off, get lost, or run away would be beneficial for many of the more severely mentally handicapped persons and their caretakers.

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Communication Aids for the Mentally Handicapped

INTRODUCTION

Mentally handicapped persons are often limited by their inabilities in communication. The precise problems vary depending on the communication required and the nature of the disability.

There have been great advances in communication aids in recent years. There are now machines available that can produce synthesized speech from letters or phonemes. Another device is capable of reading from text and producing a spoken equivalent. Despite these advances there are still unmet communications needs. Some of these problems are relatively intractable while others could be solved fairly easily.

This section describes some of the general problems that still hamper the communication of cognitively disabled persons, and a telephone dialing aid to assist in communication.

NATURE OF THE PROBLEM

Different sorts of mental disability are related to different communication problems. A person who survives a stroke or other brain damage may be severely impaired. In the worst cases the person loses almost all language functions - reading, writing, talking and listening. In other cases, only one function may be impaired.

Some retarded persons may never develop extensive communicating abilities. They may remain severely limited in this area despite persistent training. Simplified pictorial systems, such as Bliss or PICS, may allow severely communication impaired persons to communicate basic needs and feelings. The more complex aids are useful for people whose speech alone is impaired.

Some of the more intractable problems in the area of communication are :

- aphasia, or the inability to produce words (spoken or written), sometimes accompanied by the inability to understand written or spoken language,

- slow writing, which often makes such things as taking class notes or phone messages extremely difficult for

cognitively disabled people, and

- inappropriate affect, such as seeming happy or angry at the wrong times.

A more easily solved communication problem for the mentally disabled involves use of the telephone. The person may be able to speak and understand but may not be able to remember, find or use phone numbers.

USER GROUP

Aphasia and inappropriate affect are more common among stroke and brain damage survivors. Problems due to slow writing are common among almost all cognitively disabled people. Problems in using the phone are also common, especially for people who are moderately to severely impaired.

A device to simplify the use of the telephone for common or emergency numbers could be helpful to physically disabled persons and young children as well as to mentally handicapped people.

BENEFITS

Communication aids can provide benefits in almost every human activity. Communication is such an essential part of human endeavors that it affects work, play, social, and even self care activities. The incredible amount of work invested in different communication aids attests to this fact.

The benefits of a simple phone dialer would primarily be for the safety and security of moderately to severely impaired people.

A PRODUCT EXAMPLE

A device is required that allows a mentally disabled person to reach a frequently used or an emergency number quickly and easily. A person should be able to call a family member, doctor, fire department, police or friend without having to record, remember or dial the number.

Description of Function - The telephone dialing device should consist of an adaptation to a commercially available model. The input device should be a large area membrane keypad. The person should be able to press a photo or drawing of the person or emergency

service needed and let the device do the rest. This device will allow error free dialing of commonly used or emergency numbers.

Essential Features - The essential features are a telephone, an automatic dialing device, and a picture keypad. The phone can either be standard or a speaker phone. The dialer should automatically hang up if there is a busy signal, a dial tone after the conversation, or no answer after a certain number of rings (10 or so.)

The device should provide feedback for all states and actions. For example, a tone or beep should signal when a picture has been pressed. A visual symbol should let the user know when the dialer disconnects. It should be easy for a helper or caretaker to program the device and install the appropriate pictures. The pictures need to be large and clear, and adequately spaced to prevent accidentally pushing two at once.

Desirable Features - Some standard pictures representing fire, police, doctor, etc, should be provided. The unit should be suitable for either fixed mounting or portable use. In some cases it would be beneficial to be able to record a message on a tape to be played over the phone for use by a person with limited speech.

A set of large-key, colour-coded dialing buttons would provide an

alternative simple input device. This would allow the person to dial any number with an easier code and easier operation than a normal phone.

Physical Parameters - The keying device must be quite durable to withstand strenuous use. A molded plastic housing can be made in a variety of colours. The actual communications electronics could be housed in a separate unit. The keying device should be connected by a sturdy coiled cable. It should be lightweight and easy to lift.

Potential Problems - Problems could occur in the operation of the telephone aid. The user could forget to hang up after a call or a busy signal. The device should do this automatically. The user should get some clear feedback that the phone has been hung up.

If the system also has colour-coded dialing keys, a method is needed for reproducing the colours for coding phone numbers. This need could be addressed by a set of coloured decals or markers that match the colours on the device.

Human Factors Requirements - The device would require testing of prototypes to insure that all human factors requirements had been addressed. The size of the picture keys and colour keys should be about five cm on each side. A raised area between the

keys can prevent the accidental pressing of two keys at once. The colours used for coding should be easy to discriminate and name. Work is also required on standardized pictures for medical, police or other help.

Adaptability - Changing pictures and associated phone numbers makes the aid adaptable to different needs and situations. The addition of a set of large, colour coded keys increases its potential utility for various people. The system should be made compatible with existing phones and jacks.

Signs and Directions - Two sets of directions are required. One is for the person setting up the system, and putting in the pictures and phone numbers. The mentally disabled person requires simple signs and instructions for operating the aid. For example, a round green light could indicate when the unit is on and operating and a hexagonal red light could signal that it is off or has hung up.

Development - Many sorts of phone dialers have already been developed. One has even been modified for single switch operation. These units are too complicated for some mentally disabled persons, however. It should be fairly simple to adapt new keying devices to existing components. The special functions, like auto hang up on a busy signal, would require special development. The eventual cost of the device would be somewhat more than a

commercially available phone dialer. It would greatly enhance the communication abilities of many severely impaired individuals and would provide benefits of easier social contact and more reliable response to emergency situations. These benefits would justify the costs for a large number of users.

SUMMARY

An impressive variety of communication aids have already been developed for persons with perceptual, speech, and understanding difficulties. Since communication problems and capabilities vary greatly, more kinds of aids are needed. There are some very difficult communication problems, such as aphasia, or loss of expressive ability. Other communication problems can be solved more easily. A device is suggested to assist mentally disabled persons in using the telephone. It would have large picture keys for frequently called or emergency numbers. It should also have large, colour coded keys for dialing other numbers.

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Physical Aids for the Mentally Handicapped

INTRODUCTION

Many technical aids have been developed for the physically disabled. Some of these can be helpful to a mentally disabled person with physical difficulties. Self-help aids for cooking, dressing, and cleaning, as well as exercise devices for developing strength, balance or coordination can be found in many rehabilitation catalogues. Many more such devices are needed.

Information about the availability of physical aids is also too limited. Recent efforts to put the relevant data onto computer databases offer a clear improvement. This information should not be limited to physical aids, however.

An example of a needed physical aid is an adaptable grasping device. This would serve as a "spare hand" for persons with limited use of one arm or hand, and as a grasping device for people with limited grasp.

NATURE OF THE PROBLEM

Many people who have cognitive handicaps also have physical problems. For persons who have survived stroke or brain damage this often involves weakness in one arm or on one side of the body. People whose mental disabilities are related to advanced age may have a variety of physically limiting conditions. Developmentally delayed people may have difficulties with grasp, balance, or fine motor control. Perceptual problems occur in all of these groups more frequently than average.

Of course, not all cognitively disabled persons have physical problems.

USER GROUP

Simple self-help and exercise aids can assist the physically impaired as well as the mentally disabled. This often includes large members of the population with minor physical difficulties from arthritis and other ailments. Recently, in Sweden, eating utensils with large handles designed for the physically limited has become popular on the mass market. It's easier for everyone to use.

There might be a similar mass market for a device designed to act as an extra hand. Aids have been designed to grasp specific objects such as bread for spreading sandwich ingredients, or for holding jars while opening lids.

BENEFITS

Physical aids benefit the user by providing assistance in necessary activities. These activities include food preparation, dressing, self-care, mobility, transportation, employment and recreation. In many cases the activity would otherwise take the person a very long time, or be impossible without assistance from another person.

An adaptable grasping aid would help people with weak grip or limited use of one arm or hand. It could be used to help in getting dressed, cooking, crafts and countless other activities.

A PRODUCT EXAMPLE

A physical aid that would help many stroke and brain damage survivors is something to substitute for the use of a paralyzed hand. It could also be useful to many other persons, both handicapped and non-handicapped.

Description of Function - The device would be adaptable to a great variety of settings. It could be attached to any edge or smooth surface and could grasp a variety of different objects and hold them stationary in an adjustable position.

This device would allow someone with the use of only one hand to do many things that would otherwise require two hands. It could, likewise, allow persons with full use of both hands to do things that would ordinarily require three hands.

Essential Features - The device must be able to be operated easily with one hand. This requires quick release levers at all joints and at both attaching ends. The device is connected to edges with an adjustable clamp. This clamp can be replaced with a pair of large, remotely activated suction cups for attaching to a smooth surface, or a handle for use as a reach extender. When used with a handle a cable can close the grasping clamp.

The first joint and the third joint should be able to rotate and raise or lower. The centre joint needs only to change angle in one plane. (These movements mimic those of the shoulder, elbow and wrist.)

The manipulating end should also have various attachments for grabbing different objects. Clamps similar to those used for chemistry laboratory glassware could be very useful. Changes would

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be required to allow better opposition of the "fingers" and easier adjustment of the span of grasp.

Desirable Features - Additional components could serve other grasp functions. Padded tips could allow grasp of clothing. If the device was attached to a chair or door it could serve as a dressing aid. On a table it could serve as a sewing aid. With a small vise or locking clasp it could be used for work or crafts.

With a larger span to the grip, the aid could hold a flashlight for evening transportation, or a hair dryer on wet hair.

Physical Parameters - The precise physical parameters should be based on in-depth study of common grasp problems. The section lengths need to be shorter than the corresponding lengths on a real arm, for the sake of stability and ease of reach.

Suction cups should be at least five cm in diameter to assure good grip. The clamp for mounting the aid on a table, door or piece of equipment should be able to grip an edge as small as 0.3 cm or as large as 20 cm. The various "hand" attachments should be able to grasp objects from as small as a needle to as large as a two-litre juice can.

Materials should be strong and durable. The device has to be easily adjusted, or components changed, using only one hand. The device

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should be aesthetically pleasing and come in a carrying case for portable use. (The carrying case needs to open and close with one hand also.)

Joints, adjustments and releases must be well made to withstand frequent and heavy use.

Potential Problems - If there are too many attachments the aid may be confusing for some people. This problem could be solved by offering the mounting and "hand" attachments separately. Some people might need only one basic attachment for each end.

In existing devices there is sometimes a problem of stability. This requires that the arm sections not be too long and that the material and joints not be flexible once positioned.

Human Factors Requirements - The optimal size of the device will depend on the size of the user. Preliminary data suggest that the arm should be comprised of two sections about 30 cm each. Testing of prototypes on typical users should answer more detailed human factors issues.

Adaptability - One of the prima y features of this aid is its adaptability. It is meant to serve a variety of functons for a variety of individuals. A disabled person might use it for 20 different things in a single day.

Signs and Directions - The device should come with simple instructions. The levers used for making adjustments should be of different colours than those used for changing components. Simple pictures showing common uses of the aid should be included.

Development - The various connections, adjustments and releases require extensive work for smooth and easy operation. In addition, more study of typical grasp problems and difficulties is required for design of the grasp attachments. The units themselves need not be expensive, particularly if there is a large market for them in the general public.

SUMMARY

Cognitively disabled persons often have physical difficulties as well. There are many physical aids available, but only a few of them are useful to the mentally handicapped. Some are too complicated and many are designed for needs special to the physically disabled. Another problem is lack of information about the availability of these products.

A flexible and adaptable device for holding objects would be useful for some mentally disabled persons. It could also benefit some physically disabled and some non-disabled persons.

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Transportation Aids for the Mentally Handicapped

INTRODUCTION

Transportation and mobility are critical for many activities in modern society. Some recent developments in computer communications permit much greater interplay between a person at home and the outside world. But the ability to get around in the world still gives innumerable advantages. The transportation needs of mentally handicapped persons have not received as much attention as the problems of the physically disabled. In some cases, mentally disabled people also have minor physical disabilities that interfere with their mobility.

As with other areas, the transportation problems of the cognitively handicapped vary with age and degree of disability. Technical solutions for these transportation problems range from proper car seating for large retarded children to adaptations of mass transit policies, facilities or information services.

NATURE OF THE PROBLEM

Mobility and transportation problems are common among people with all different sorts of cognitive disabilty. For the retarded or multiply handicapped child, even the most basic movements may be impaired. These children may require special training and postural support. Appropriate seating is a clear transportation need for many severely disabled people, whether the disability is physical or mental. In the case of older retarded children, commercially available children's seats are too small. Normal children are presumed to be able to use a seat belt by the time they outgrow the car seat. Older retarded children may lack the physical ability to maintain proper posture (eg. difficulty holding their heads or torsos up in a moving car) or the understanding and self-control needed to stay buckled into an ordinary seatbelt. Special seating may also be required on public carriers such as airlines, trains and buses.

For other mentally handicapped persons, physical transportation problems relate to specific physical limitations. Survivors of stroke and other brain damage may have movement impairments that limit their use of cars, buses, subways, and even bicycles. Many kinds of mental handicaps can also involve balance or gait problems that make use of public transportation difficult or impossible. The

speed of doors closing, the pushing crowds, the swaying and lurching, the large size steps may all intimidate a mentally disabled person. They even discourage persons with minor physical problems, and no mental handicaps, from using public transit. The mentally disabled person may have little other choice except staying home or being dependent on someone else for a ride.

Some physical transportation problems have been addressed with technical aids. People with paralysis on one side of the body can drive cars with special adaptations for operating with one hand and foot. Training and assessing cognitively disabled drivers presents other challenges which haven't been adequately addressed.

The cognitive transportation problems of the mentally disabled have to do with spatial orientation, route learning, and use of signs, schedules, fares and maps. A retarded child doesn't learn his/her way to and from the store, park or school as easily as a non-retarded child. S/he may be less able to get help if lost. The retarded child may have a hard time learning his/her name, address and phone number. Learning problems delay his/her independent use of buses for even simple journeys. A retarded child may require many training "runs" to learn the route. Some parents report having to follow along in the car for several trips to make sure that the child gets on and off at the right places.

Mentally disabled children and adolescents can require special

training for each route they take. They may not be able to read or use signs and schedules made for people with average mental ability. The same is true for persons with learning disabilities in reading.

Adults with mental disabilities have some similar problems with transportation. Mentally disabled elderly persons may be confused about stops or fares, or even which door is for entering the bus. Their hearing may not be adequate to understand messages or instructions presented over a loudspeaker. (Even non-impaired people have a hard time understanding loudspeakers.) They may require a lot of cues for identifying their stop. If the bus is crowded, they can't see enough of these cues.

Mentally disabled people frequently have a hard time finding their way around, especially when outside their own neighborhood. They must generally rely on special transportation or being driven by someone in a car. In a recent survey, many mentally disabled people reported difficulties in getting to places. It seemed especially difficult for them to get to other cities, recreation and entertainment, the doctor, and shopping. Only about 20% of the respondents used public transit on their own.

USER GROUP

The potential user group for transportation aids for the mentally disabled seems large. Almost all mentally disabled people are being integrated into the community. This implies that they should have access to transportation to participate in community life. Transportation aids that deal with minor physical limitations would also be useful for mildly physically handicapped people with no mental disabilities. Products to help with the cognitive tasks of transportation could be useful for many non-disabled people, too. Such aids are particularly helpful the first time someone uses a specific route or mode of transportation.

Since most mentally disabled persons experience some transportation problems, solutions to some of theses problems would benefit many potential users.

BENEFITS

The likely benefits of transportation aids for the mentally handicapped are far reaching. They include more independent functioning, easier access to community resources, and a fuller life for cognitively disabled persons. Improved car seating for mentally

handicapped children could expand opportunities for both the children and their caretakers. Easier access to public transit and aids for using routes and schedules could help mentally impaired people get to and from important places such as doctors and stores. If mentally disabled people are to be integrated into the community, easier access to transportation is essential for their success and happiness.

A PRODUCT EXAMPLE

Many more mentally disabled persons could use public transportation if they had some help knowing exactly how to get from point A to point B. This often requires a customized guide or map. Aids like this have been used successfully for individuals, but a system for creating customized maps on a larger scale is needed. Although the time and energy used to produce a guide can easily be saved if the user can go places independently, a more efficient production would provide even greater benefits.

In many cases public transportation agencies provide individual route information by telephone. If they could provide a hard copy of this sort of information, in a clear and simple format, many of the transportation problems mentioned above would be solved.

Description of Function - The function of a customized

map or guide is to present the essential information concerning choice points, in a manner that helps insure correct responses by the traveller. Some individual attempts at a solution have utilized a small photo album with photographs of choice points such as street corners and bus stops. The user has a sequential guide to getting from one place to another and back. A more automated system for producing customized guides would facilitate use of public transit by more mentally disabled persons. This map system could be integrated with other transit information, such as schedules and vehicle identification, to further facilitate use of the transit system.

Many mentally disabled people would still require some training and assistance to use public transportation. But they could learn a route more easily and take it with fewer errors, if they had a simple guide or map. The map could also be useful in finding assistance if the user becomes lost or disoriented.

Essential Features - A customized map for a mentally impaired person needs to be simple, correct and easy to use without errors. These considerations might lead to different versions of maps or guides, depending on the level of functioning of the user. For example, people who can't read require pictoral and/or symbolic representations of choices rather than verbal descriptions of choices.

The guide needs to have clear information about the correct response

at each choice point. Some means for keeping track of the place in the sequence is also necessary. In the case of photo books, each page is a choice point with a graphic indication of the correct choice (eg. a superimposed green arrow.) The user keeps track of he sequence by turning the page after each choice. If a map were made on a page or card, some other means of keeping track of the next choice would be required. This could be accomplished through moving a marker, folding sections, or marking finished steps with an erasable mark.

The maps or guides would be most useful for places that the mentally handicapped person goes to frequently. They should be durable and reusable. The mentally disabled person could thus have a consistent and reliable guide for getting to important places. For example, a retarded child might only need a map for taking the bus to school and back home, while a cognitively disabled elderly person might have several maps to help them make the round trip to shopping, library, community centre, doctor, friend, etc.

Desirable Features - It would be desirable to have some standards for simplified guides. If transit companies, rehabilitation workers, family members, and even commercial mapmakers used consistent format, symbols and cues, it would be easier for a mentally handicapped person to use more than one map.

The maps or guides should be set up so that the directions to some

goal aren't confused with the directions to get back home. This could be done by placing one route on one side and the return on the other side of the card or pages.

Physical Parameters - Two basic approaches seem viable as simple formats. The first is a small binder with pictorial directions for each choice point on a successive page. The outward route and homeward route each have a distinctive symbol in the upper right corner. The user starts on the first page of the outward route. After the first choice is made (eg. turn left at the front sidewalk) the user turns that page back and sees the next choice (eg. turn right at the corner.) Thus, the user only has to deal with one decision at a time, and keeps his/her place in the sequence by turning the page after that decision is made.

This approach could use instructions from a variety of sources. Transit companies could help immensely by providing simple drawings of bus stops, transfer points, buses, subway entrances, etc., that would fit in the booklet. Homemade drawings or photographs could be used for the individualized directions to and from the transit stops.

The other format would be a simplified map that shows the spatial relation between the home and goal. For example, a map of the route from a person's home to a community centre could be made on a durable card. If the card was durable enough, it could have the route cut out. A position marker could then be moved along the route to help

the person keep their bearings.

This type of map would be more difficult to make and less flexible in its potential adaptability, but it would have other advantages. Although some individuals might require step-by-step instructions about each choice, others could make better use of a real map than a step-by-step guide. The map provides relative spatial cues that the user can learn. This would help the person become more familiar with their neighborhood. Routes to several nearby places could be shown on one map. In addition, training on simple maps might make it easier to learn how to use more complicated maps.

(Interestingly, these two formats correspond to two time-honoured psychological conceptions of navigation, response learning and position learning. Learning a series of responses or choices may be best for some people or some situations. For others, or in other situations it's best to rely on relative spatial position cues.)

Potential Problems - In many situations a great deal of individualized work will be required to develop effective maps or guides. In some applications, such as in small towns with no public transit, a homemade guide for use while walking or bicycling would be useful.

In large urban areas, public transit companies could develop components describing routes and connections, in consultation with

people familiar with mentally handicapped persons' needs and abilities. Those people helping the cognitively disabled person might be able to provide the individualized directions for getting to and from the transit stops. Or it could support a small commercial venture for a photographer with an instant camera and some coloured, stick-on arrows.

In larger applications there would be a need to automate or standardize production of maps or guides. For maps, a computer database could be used to generate simple graphic representations of routes and transfers. If step-by-step guides were used, a basic bus, bus-stop, or intersection picture could be reproduced with identifying letters or symbols for the specific bus or transfer.

Human Factors Requirements - Before a standard format is designated or maps and guides are produced, more information is required on specific cognitive and perceptual human factors. Pilot research with a few mentally disabled persons would provide invaluable guidance on design features. The manner of carrying a map or guide, necessary size of symbols, letters and numbers, common mistakes, rate of learning using different formats, and many other issues would require investigation.

Adaptability - To be most useful, maps and guides need to be adapted to different needs and users. Some users may have specific spatial orientation impairments or no reading ability.

A guidebook format would be most adaptable. It could even be used to serve other needs of the mentally disabled person. For instance, a guidebook to and from the grocery store could have pages in the middle for simple pictures of required food and household items. The user could go to the store, do his/her shopping, and come home using a single, step-by-step guide.

Development of a computer based system for making custom route maps for mass transit could be adapted to a system for the general public, or data including streets, public buildings, addresses etc. in additon to public transit data.

Signs and Directions - Transportation aids such as maps and guides consist of signs and directions. However they may also require signs and directions for their construction or use. In particular, a standard or consistent system for making guides would require instructional guidelines for making useful, consistent aids. A computer program for making custom route maps would require extensive documentation.

On a more basic level signs and directions are also important. Direction of travel, cues and landmarks, and other features of the aid need to be clear and as "mistake-proof" as possible. Additional directions would also be useful. An example of a useful additional direction would be a brief written description of the goal along with

the user's name, address, etc. This could be shown to someone else as an aid in getting help if the user does become lost or disoriented.

Development - Some individualized maps and guides have been developed by individual professionals for individual persons needing such an aid. To apply these ideas to a larger group of users would require development of systems for producing maps and guides more quckly, easily and cheaply. For many applications it would be sufficient to develop a durable small binder and some simple pictures and symbols. Professionals, volunteers or family members could then have the basic items necessary to construct guidebooks with some homemade drawings or photos. Some general suggestions on making simple guides and training the mentally disabled person to use them reliably should be developed to go along with the binder and the stick-on arrows and symbols.

On the more high-tech end, considerable work would be required to develop a system for producing customized, simple route maps from a computer database and graphics system. Although this approach would require more input originally, it could result in long range savings of human effort and time in producing individualized aids.

SUMMARY

Mentally handicapped persons have many mobility and transportation problems throughout their lives. Some relate to proper seating and restraint products. Others result from associated physical disabilities. Those transportation problems resulting from attitudes toward the mentally handicapped have received little attention.

One area where new products could help is in dealing with orientation and spatial learning problems. Simple maps and guides could be used by a variety of cognitivley disabled people to help them have access to community resources. Many mentally disabled people are limited in important areas of daily life and self-support because of transportation problems. Methods to help them get to and from important places independently could greatly improve their quality of life and reduce their need for assistance.

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Teaching/Learning Aids for the Mentally Handicapped

INTRODUCTION

Learning refers to changes in behaviour as a result of experience. Learning problems are at the root of many difficulties faced by mentally disabled persons.

Generally slowed development and learning characterize retardation. Specific developmental disabilities usually involve learning disorders. Survivors of brain damage and stroke typically need to re-learn a variety of things - speech, movements or basic orientation and perceptual skills, to name a few. People whose cognitive disabilities are related to aging may also have learning difficulties. For all of these people, learning may be painfully slow and difficult.

Technical aids for teaching and learning range from old and simple to modern and sophisticated. Micro-computers and specialized teaching equipment are in use for the general population as well as cognitively disabled persons.

New aids or products to assist in learning and teaching could provide significant advantages for many mentally disabled people. Much of the future development of this field will be in the area of electronic equipment and software that is "user-friendly" for users with various mental disabilities.

Computers offer distinct advantages in aiding learning by cognitively impaired persons. Computers can keep track of all sorts of information, levels of difficulty, and responses by learners. They are infinitely patient and aren't offended by inappropriate behaviours. Computers can give instant feedback to learners without showing boredom or disapproval. They can be programmed to say nice things in a personal manner or even to give rewards. They can even provide social links.

Computer assisted learning is being developed for general school programs. It should be adapted on a large scale to the learning needs of the cognitively disabled, as well.

NATURE OF THE PROBLEM

The effects of learning difficulties on the life of a mentally handicapped person depend on a number of factors. The nature and degree of disability, and the person's previous learning, interact

with all the other factors known to affect learning.

For a retarded child, for example, learning problems affect all aspects of life from eating to socializing. In more severe cases these learning problems cause such difficulties that parents often can not take care of their retarded child without a great deal of support and assistance.

For a child with mild retardation or a specific learning disability, early development may not cause much problem or concern. Difficulties may only become a real problem when the child goes to school. The resulting frustration, loss of self confidence, and social isolation compound the learning problems.

Recent experience has shown that early intervention can make a huge difference in the learning ability of cognitively handicapped children. Especially for retarded children, extra efforts to help the infant or child to learn can keep him/her from falling farther and farther behind. Aids to teach parents early stimulation programs, and to help them find support and resources, are much needed.

Teaching/learning aids for the children include the gamut of educational toys and special education materials. There is much potential for useful new developments in this area.

The approaches and material used for young children are often not appropriate for an adolescent or adult, even if the level of comprehension is equivalent. Different aids, materials, and learning toys need to be developed for different aged people as well as for different levels of ability.

People who have suffered a stroke or some accidental brain damage may have special learning problems. It may be even more difficult to re-learn something than to learn it the first time. A brain damaged person can have perceptual difficulties and specific cognitive impairments that necessitate special approaches and intensive efforts. In addition, the need to re-learn things you once knew, and that all your peers still know, increases the personal difficulty.

The rehabilitation of brain damage and stroke survivors requires a long term investment of effort. Hospitals usually discharge these people when their physical health has stabilized. This is only the beginning of their recovery, however. Teaching and learning aids for people who have had a stroke or brain damage should cover a broad range of cognitive skills. The approach should be stratified for all degrees of impairment and recovery. Such systems are presently limited to a few software programs for perceptual and cognitive retraining, and commercial or homemade special education materials used in a few rehabilitation hospitals.

For the mentally disabled elderly, there are two major goals related

to learning. The first is to maintain previous learning. The other is learning new information or adaptations. Technical aids could help by maintaining the contacts, cues and activities that keep mental abilities and specific memories intact. Aids for learning new information and adaptations to their condition could help the mentally impaired elderly as well as younger cognitively disabled people. Unfortunately, elderly people are sometimes more intimidated by computers and high technology than are younger people.

USER GROUP

Since almost all mentally disabled persons have some learning difficulties, the potential users of learning aids are many and varied. People without general or specific learning problems can also benefit from products and adaptations that make learning easier.

Software developments can be distributed relatively easily and cheaply, even over the telephone. This factor greatly increases the number of potential users for a particular learning aid.

BENEFITS

The benefits of learning aids are, likewise, many and varied. Any product or adaptation that makes learning easier for a mentally

disabled person will improve that person's life. The specific benefits could range from helping parents raise a retarded child in a loving and stimulating home, to helping a brain damaged person learn to read again.

The positive effects of technical advances will vary depending on the product and the situation. The product example suggested below is a micro-computer program for teaching visual recognition. Its benefits for an accidentally brain damaged person could include more rapid rehabilitation of related functions, improved abilities in visually guided behaviours, increased self-reliance and self-esteem, and decreased rehabilitation and care costs.

A PRODUCT EXAMPLE

People suffering from some types of brain damage or stroke have impairments in their abilities to extract visual information and make decisions based on similarities or differences between visual stimuli. These perceptual skills and abilities can sometimes be re-learned through extended practice. Learning is enhanced if the learner gets quick feedback about the correctness of his/her response.

Programs suitable for micro-computers could assist in re-learning visual or other perceptual skills. Most small computers in homes and

schools would support the necessary visual display graphics and user responses. Such programs might also be useful in assessment of perceptual impairment.

Description of Function - A program to assist in learning visual perceptual skills would 1) present visual tasks to the learner, 2) prompt and measure the responses, 3) analyze the results, and 4) select the sequence of tasks to optimize interest and improve performance. It should be suitable for a variety of levels of impairment.

Essential Features - The learning program must employ a comprehensive range of tasks, and a variety of approaches to each skill. All different sorts of visual tasks must be presented in different visual positions since different perceptual problems may occur in separate visual "fields". A variety of different tests of a particular skill can provide interest, graded levels of difficulty, and better generalization. If the skills are going to be used in many different situations, the visual displays and response demands need to have some variability.

The program must be easy to operate and must give the user effective feedback about performance on the tasks.

Desirable Features - In many applications the user will

be working with a rehabilitation specialist. With computer feedback and communications, this would no longer require one specialist standing there, looking over the shoulder of each learner. One teacher is able to monitor more students with computer assistance. And the input of the rehabilitation specialist can be at an office terminal while the learner works at home or in school. The program should provide performance results to the rehabilitaion specialist either on-site or over the phone.

Another desirable feature would be touchscreen capabilities. If the mentally disabled person can touch the display screen to indicate his/her response the task can be both easier and more natural. This capability is a function of the screen and operating system as well as the learning software.

Physical Parameters - The physical parameters of software are fairly limited. The program consists of a series of statements or codes that cause a particular type of computer to operate according to certain instructions. The most popular physical format is a diskette and printed instruction booklet. Besides transfer through diskette, cassette or tape, software can also be downloaded or distributed over the telephone.

Memory size of a computer poses other physical limits on the software. Some home computers have as little as 4K or 8K bytes of

random access memory. But the trend is toward more memory, with some small computers being run with multi-megabyte hard discs. Use of a compressed graphics code, such as Telidon, would optimize use of memory space. This code would necessitate additional hardware, however.

Potential Problems - The main problem which would reduce the usefulness of programs for learning visual skills would be if users get confused, lost, discouraged or frustrated. These problems can be addressed through pilot studies of users' responses to the learning programs. Some brain damaged people might require extensive or ongoing supervision to use the learning aid to its full advantage.

Another problem is the choice of computer, operating system and peripheral devices required for the programs. It is usually best if different versions can be made available for some of the most common hardware systems (eg. Apple II, TRS, etc.)

Human Factors Requirements - The essential design issues for software are human factors issues. The physical human factors affect the design of interface features. The keyboards, joysticks and other response devices, as well as limits of the visual display, are features of the different computers. The program designer needs information on normal physical responses to visual tasks, as well as problems characterizing impairments. Possible physical impairments can also affect appropriate use of response devices.

Specific visual and cognitive human factors must guide the selection of tasks and the routines for sequencing the tasks. There are many sources of data on performance of visual tasks. These tasks have descriptive names like tracking, matching to sample, delayed visual pattern recognition, backward masking and the like. Different tasks use different visual skills. For instance, delayed pattern recognition involves a series of sub-tasks. The person must extract and remember visual features of one picture or display. Then s/he must use that information to recognize the pattern again. The delay, the complexity of the pattern, the number and similarity of alternative choices, and many other factors can affect performance and learning.

Adaptability - Programs for learning perceptual skills should be adapted to various common computer systems. They could also be designed so that different visual stimuli could be substituted in the various tasks. If the basic tasks, response options, etc. could be separated from the codes for the specific visual stimuli, different sets of visual stimuli could be inserted into the appropriate places in the program to increase the possible variability in visual requirements.

Signs and Directions - In computer software for aiding learning there are at least two levels of signs and directions. One

is the printed directions identifying the software and the appropriate computer system, and instructions for starting and using the program. The other level consists of the on-line cues, prompts, symbols and instructions. There may also be special "help" instructions as well as instructions for the teacher or rehabilitation specialist.

All of these levels of signs and instructions require special attention to clarity and simplicity. Vague or poorly worded instructions, or symbols that confuse or mislead, cause difficulties for non-impaired persons. Brain damaged people require particularly clear and simple signs and directions.

Development - Software development is in a rapidly expanding state. Computers are even developing software for other computers. Computer graphics and response interfaces are also developing rapidly. Programs to aid learning can be improved by continual updating and revision. Development in this field should be seen as an ongoing effort to achieve the goals of easier learning and better generalization to real-world situations for mentally disabled people.

Some learning programs have already been developed for brain damaged people. Other programs have been developed for general educational purposes. Combined efforts by experts in programming, cognitive and neurological sciences, and rehabilitation need to be involved in the

long-term development of software to aid learning. Amateurs in all of these fields should also be encouraged to develop programs for learning simple perceptual and motor tasks.

SUMMARY

Many of the difficulties faced by mentally disabled people relate to learning problems. The learning difficulties may be mild to severe, and general or specific. For some groups, such as retarded children, aids for learning can help them toward normal cognitive development and life skills. For a senile person learning aids might best be used to maintain appropriate responses to a few simple emergency situations such as fire alarms. In any case, technical aids hold great promise for improving the life of a mentally disabled person, to the extent that s/he can learn to overcome their disability.

Computers offer many advantages in the education, or re-education, of mentally disabled persons. For example, software could be used to improve the visual perceptual skills of persons whose abilities have been impaired by brain damage. Proper design of such software involves a large variety of considerations. These range from the human factors of the response interface to the types of stimuli needed to provide appropriate levels of difficulty.

The development of educational software, in general, is a burgeoning

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field. Some efforts to develop software as teaching/learning aids for the mentally handicapped can greatly assist in efforts to alleviate their learning difficulties.

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Information Access Aids for the Mentally Handicapped

INTRODUCTION

From the time we wake up until we go to sleep, we need information. It is vital to everyone's daily living. We need to know about train and bus schedules, prices of tickets, locations of restaurants, recreational facilities and programs, where to look for work, where and how to contact help for a variety of reasons, and so on. When we need it, we actively seek the information, or remember it from previous experience.

We can also have access to information passively. Some might think others need information about them and what they have to offer. Thus, they distribute unsolicited information. Whatever our means of getting it, access to information is necessary for a variety of activities involved in daily living.

Individuals with cognitive disabilities can have very different daily living requirements. Many of the tasks taken for granted by others

pose difficulties for those with cognitive handicaps. Where these people might go for information which takes into account the nature of their disability, could be a difficult task in itself. For example, information pertaining to people with learning disabilities could come from a large number of sources. Lack of knowledge of where to get specific information about educational programs, therapies, recreational, social, or self-help groups, could be a barrier to making effective use of the information. Such barriers inhibit learning and personal growth.

Additionally, any inability of professionals working with cognitively handicapped people to learn what other professionals are doing and about other programs, limits the kinds of interchanges which can often contribute to improvements in existing services and programs.

There are various types of product suggestions which could improve information access for those with cognitive handicaps.

NATURE OF THE PROBLEM

The sources of information we use are as varied and diverse as the activities we seek the information for. We might know of a number of places to go for information about cooking - cookbooks, television programs, cooking classes, or informal "hobby" groups. Certainly, we will not know them all - maybe not even many. Accessing information

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requires a knowledge of where to go for information about a given topic.

If people know what subject they want information about, but do not know where to go to get it directly, often they contact more centralized sources of information. This is evident when we call general information departments. Here we either get the specific information we want, or find out how to get closer to it.

Because of the diversity of sources for information, the knowledge of where to go for even general information about a topic can be difficult to acquire. This difficulty becomes even more pronounced when the requirement for information involves groups of people with similar difficulties because of cognitive impairments. We may find it somewhat hard to locate all of the basic cooking classes in the city. How difficult would it be if the classes we were searching for had to take into account that we have learning disabilities? If, however, we knew of one location to go to screen whatever information there was about various activities for people with learning handicaps, we would not only find the task of information access much easier, but we would likely benefit in a number of other ways as well.

USER GROUP

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The user group consists of individuals with various cognitive handicaps. In common, they have limited means of accessing information which could help them to function more effectively, or simply to enjoy life more. They are individuals with learning disabilities, developmental delays, brain damage, cerebral palsy, Alzheimer's disease, to describe some of the types of disabilities involved.

BENEFITS

Improved access to information means people are likely to be more informed. With increased knowledge, there is the potential for increased use of many programs and services. It might mean more handicapped people get out to recreational and social functions because now they know of them, and perhaps also, how to get there, schedules, and so on.

Increased use is as much of a benefit for the programs and organizations providing them, as they are to those receiving them.

Increased use of facilities, services and/or programs which were being underused previously because of a lack of knowledge on the part of the public about them, fosters program growth and ultimately, the extent of the program benefits. For instance, a number of facilities and programs may be operating currently to serve the needs of people

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with aphasia. If these programs do not come to the attention of the people they were designed for, then there is little possibility that they are being used effectively. The most potentially useful programs could be shelved because their usefulness is questioned due to apparent lack of patronage, regardless of whether or not the lack of patronage stems from lack of knowledge about the programs. This is a time of budgetary cutbacks, and little use of a program is cause to question its funding requirements. If, however, more aphasic people knew about them, chances are more would participate, given they find the programs useful. Increased use is one rationale for program existence. Capacity use suggests a need for program development and expansion.

Communication among those providing the services could benefit professionals as well as the recipients. Redundancy among programs could be reduced, which improves the efficient use of resources. Professional development would be encouraged.

Those with cognitive handicaps benefit in a number of ways.

People with easier access to information have an increased awareness of what's happening. This in turn, gives them the opportunity to participate in more activities. Increased participation in programs can improve an individual's skills. This can result in an improved self-image for the handicapped person. Also, there can be more of a sense of "community". There is an increased awareness of the extent

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of a given handicap - the knowledge that there are others out there who experience similar difficulties. This sense of community also comes from the knowledge that there are many avenues of help. Perhaps more than one might otherwise be aware of with limited information access. This can also serve to help develop a positive sense of oneself. Self-confidence and a positive outlook can only foster further personal development.

Improved skills among handicapped people also means more efficient use of resources, especially when the activities require a large degree of professional help.

A PRODUCT EXAMPLE

The product example providing improved information access for those with cognitive handicaps is the use of Telidon. Telidon is a generic term for an interactive system which has a variety of information stored in computer files, and provides that information upon proper request from the user.

Description of Function - The general function of a Telidon system is to provide information. In the case of this product example, the information stored in a host computer would be relevant to people with a variety of cognitive handicaps. There

would be information about recreational programs for persons with developmental delays, for instance. Included would be information about educational programs for them, listings of possible jobs, interactive learning programs, where to locate self-help groups, what social activities were going on, and so on. To access the information, a handicapped person would only be required to know of one location where he/she could use the Telidon system. By entering some commands on the system at the Telidon location, any information relevant to a particular handicap could be accessed.

Essential Features - Essential equipment features are a terminal, keyboard (keypad, touchscreen), and modem with some form of hook-up to the host computer. Essential system and "people" features are a database and operator, people (organizations) to provide information, and some mechanism for informing people about the system and its use.

A global feature which is essential to the success of a Telidon system is that it be continually highly coordinated. Coordinating the system involves ensuring the quality of the information. It also involves regularly obtaining feedback from the users of the system to improve information content and delivery, and to monitor equipment functioning. The use and use patterns of the Telidon system must also be regularly assessed to help determine the effectiveness of the distribution system.

Quality of information encompasses all aspects - content, relevancy, extent, and how up to date the information is.

For use, especially widespread use, it is essential that those providing the information regularly forward (and are reminded to forward) their contributions. Without frequent, regular updates, the information which handicapped people access becomes stale, and this has the effect of discouraging use. If use declines, information providers will be even less inclined to regularly update information, or perhaps to provide information at all. This negative cycle could seriously undermine any potential benefits the use of a Telidon system has to offer.

An essential feature of a Telidon system to improve information access is the availability to use the equipment.

Information access by Telidon requires that people have access to the equipment, or at least the use of it. While the cost of individuals having the necessary equipment and hook-ups might be prohibitive to widespread use, there are other means to implement the system which would likely keep costs down.

Maybe the same number of Telidon terminals could reach more people if they were in different locations. Different ways of letting people know about the system (television ads? organization newsletters?)

might increase system use.

Desirable Features - An extremely desirable feature would be a system which provided auditory signals. These could help as cues for system use (when to log off, for example), as well as help with instructional programs. (Using two senses for learning could only be better than using one.)

Automatic log-off is another desirable feature. The terminal in question would be automatically disconnected from the system if it were not being used. (This could be a factor contributing to cost reductions, if there were connect time charges involved in providing the service.) This could be optionally controlled for those uses of Telidon where the system is kept on for a specified period of time (libraries, schools). When a Telidon system is near capacity use, people attempting to connect to the system often cannot do so because of other terminals which are logged on. If some of these terminals are not in use, it prevents others from using Telidon. Automatic log-off would minimize congestion, making it possible for other terminals to connect on to the system.

Messaging (electronic mail) is also a desirable feature. This would enable individuals and organizations to easily communicate directly and quickly with each other.

Other desirable features involve database content. It should include some form of "Community billboard" for jobs, events, opportunites, new programs.

Physical Parameters - The physical parameters necessary for a Telidon system are sufficient space at the user location to accomodate the equipment.

Potential Problems - One potential problem is with possible system or equipment failures. This should be continually monitored by feedback from users.

A more important initial problem is the possibility that the concept and the system never "takes off" because of lack of support among those involved. This is a key concern. It requires much coordinating and promotion to gain the active involvement and support of all the necessary parties.

Human Factors Requirements - Keyboards, keypads, or touchscreens must have keys (or touch areas) large enough so that people with coordination problems can still use them. Screens should be large enough to accomodate those with handicapped vision.

Instructions about use, and in general, the information displayed should make as much use as possible of symbols and graphics for easier understanding.

Adaptability - Telidon can be easily adapted for educational purposes. Programmed instruction would allow for the development of these instructional lessons. As a result, there would be higher quality of educational programs, and a wider distribution of many basic routines, as well as more complex learning packages. Many handicapped individuals have difficulty with routines because they have not learned tasks in a step by step fashion, which is where programmed instruction works best.

Not all tasks, of course, can be best learned using Telidon. Many however, can. These include learning simple arithmetic, how to tell time, and various concepts such as money.

Telidon has the additional advantage of making the learning somewhat novel, which can be a strong motivational factor.

Signs and Directions - The use of graphics and symbols is a plus in a number of ways. First, the Telidon system is ideally suited for graphics display. Second, many of those with cognitive handicaps have difficulty reading. The use of graphics would tap a

strength of the system while making it much easier for users to understand the information being accessed.

Maps and directions could easily be displayed.

Signs and symbols could also aid in learning shapes, colours, and in general pictorial representation of numerous concepts.

Development - The various technologies relevant to Telidon are actively being developed. Lessons learned from other applications of Telidon can be extremely helpful. Some specialized equipment or adaptations might need to be developed for mentally or physically disabled people.

The main development needed is in the areas of equipment access and a specialized database. Such a project would need strong support from a community or advocacy group. Some party needs to serve as the publisher, to collect information, organize it on the database, distribute it, update the data, and help users find the information they want.

SUMMARY

We are becoming more and more an information based society. People with mental handicaps need special help to keep up with information.

Their abilities may be impaired for finding, understanding, remembering or applying facts, schedules and other information. A specialized information network could help with some of these problems.

Telidon based systems meet many of the requirements. They can make efficient use of graphics (though too often the graphics are needlessly complicated.) The information can be organized in terms of interest areas, special groups, or level of user ability. If mentally handicapped people had access to an information system designed for them, their lives could be helped immensely.

Cognitively disabled people need the same information as everyone else, and special information, too. They need to know about employment, recreation and education opportunities. They also need special help in learning, meeting people with similar problems and accessing special services. An information network can also serve as a "meta-aid", helping people learn about, acquire or make other aids for dealing with their cognitive limitations.

POOR

QUALITY

ORIGINAL